Water Management Plan

United States Environmental Protection Agency
Ground Water and Ecosystems Restoration Division

Robert S. Kerr Environmental Research Center
919 Kerr Research Drive
Ada, Oklahoma 74820

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EPA

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
ROBERT S. KERR ENVIRONMENTAL RESEARCH CENTER

WATER MANAGEMENT PLAN

Approved by:

Frank W Price 12/08/05

Frank Price, Facilities Manager — Date

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1.0 EPA'S STATEMENT OF PRINCIPLES ON EFFICIENT WATER USE

In order to meet the needs of existing and future populations and ensure that habitats and ecosystems are protected, the nation's water must be sustainable and renewable. Sound water resource management, which emphasizes careful, efficient use of water, is essential to achieve these objectives.

Efficient water use can have major environmental, public health, and economic benefits by helping to improve water quality, maintain aquatic ecosystems, and protect drinking water resources. As we face increasing risks to ecosystems and their biological integrity, the inextricable link between water quality and water quantity becomes more important. Water efficiency is one way of addressing water quality and quantity goals. The efficient use of water can prevent pollution by reducing wastewater flows, recycling process water, reclaiming wastewater, and using less energy.

EPA recognizes that regional, state, and local differences exist regarding water quality, quantity, and use. Differences in climate, geography, and local requirements influence the water efficiency programs applicable to specific facilities. Therefore, EPA is establishing facility-specific Water Management Plans to promote the efficient use of water and meet the water conservation requirements under Executive Order 13123, Greening the Government Through Efficient Energy Management.

This Water Management Plan has been established to document and promote the efficient use of water at the Robert S. Kerr Environmental Research Center in Ada, Oklahoma. The plan is organized according to the Federal Energy Management Program (FEMP) Facility Water Management Planning Guidelines under Executive Order 13123.

2.0 FACILITY DESCRIPTION

EPA's Ground Water and Ecosystems Restoration Division (GWERD) is housed within the Robert S. Kerr Environmental Research Center. The Center, situated on a 16-acre tract, is located three miles south of Ada, Oklahoma. Completed in 1966, the main laboratory building provides approximately 50,000 square feet (sq ft) of laboratory and office space in a four story structure. An addition to the facility in 1993 provides another 16,351 sq ft for the library, computer support services and a conference center (LCC addition). The nearby 7,460 sq ft annex building contains a machine shop and storage facilities for field equipment and supplies. Separate, smaller buildings have been constructed for storing bulk chemicals, compressed gases, and hazardous waste. In total, the research center contains 77,875 sq ft of conditioned space. It is owned and operated by EPA.

GWERD, part of the National Risk Management Research Laboratory (NRMRL) conducts research and provides technical assistance to support the development of strategies and technologies to protect and restore ground water, surface water, and ecosystems impacted by man-made and natural events. The Division's research programs include basic studies to enhance understanding of the physical, chemical, and biological processes that control the transport of mass and energy in surface and subsurface ecosystems through the movement of water;

laboratory and field studies to develop and evaluate the means to protect and restore ground and surface water; studies to evaluate the benefits of efforts to restore and manage ecosystems; and studies of the impacts of concentrated animal feeding operations on water quality. The research center contains state of the art equipment to provide analytical chemistry support for environmental research.

3.0 FACILITY WATER MANAGEMENT GOALS

The resource conservation goals of GWERD are achieved through the implementation of an Environmental Management System (EMS). The EMS has been established and implemented consistent with the laboratory environmental management policy. The laboratory environmental policy statement is provided below.

Environmental Management Policy

The mission of the U.S. Environmental Protection Agency's Office of Research and Development (ORD) is to perform-state-of-the-art research to identify, understand, and solve current and future environmental problems, provide responsive technical support to EPA's mission, integrate the work of ORD's scientific partners (other agencies, nations, private sector organizations, and academia), provide leadership in addressing emerging environmental issues, and advance the science and technology of risk assessment and risk management.

The ORD continues to encourage and set an example of research and development activities, which use effective environmental management systems that focus on regulatory compliance, pollution prevention, resource preservation, and public outreach. With this policy, the National Risk Management Research Laboratory - Ground Water and Ecosystems Restoration Division in Ada, Oklahoma joins other ORD sites in committing to implement an EMS for our own employees, operations and facilities.

At ORD/NRMRL/GWERD, we commit to reduce the environmental impacts and consumption of natural resources from our facility operations and comply with legal and applicable requirements. Our environmental management system will be designed to meet the following goals:

- Ensure compliance by meeting applicable environmental requirements while conducting research activities;
- Strive to continuously improve environmental performance;
- Integrate source reduction and other pollution prevention approaches into day to day research activities;
- Consider the environmental impact in planning, purchasing and operating decisions;

- Establish, track and review specific environmental performance goals and employee awareness; and

- Share performance information with our research partners and other parties.

4.0 UTILITY INFORMATION

Contact Information

Potable water supply and sewer service are provided by:

Ada City Utilities
210 W. 13th
Ada, OK 74820

580-436-8140

Water Rate Schedule

GWERD is billed for water use associated with six meters under five accounts. The account numbers and associated usage is provided in Table 1.

Table 1
GWERD Water Use Accounts

Account Number	Description	Meter Location
60-0475-00	Library Conference Center (LCC)	Below grade, exterior north face of LCC
60-0480-00	Main Laboratory	Below grade, exterior north corner of main laboratory
60-0485-00	Main Laboratory Bypass	Below grade, exterior north corner of main laboratory
60-0490-00	Cooling Tower, Hazardous Material Storage	Below grade, exterior southeast corner of cooling tower structure
60-0495-00, meter 1	Irrigation Sprinkler	Below grade, east of main parking lot
60-0495-00, meter 2	Annex Building	Below grade, east of main parking lot

Each account is billed a minimum monthly charge of $8.50 for the first 200 cubic feet of water, and $1.44 for each additional 100 cubic feet ($1.92 per 1,000 gallons).

Sewer Rate Schedule

Sewer service is billed based on water utilization on each account. Service is billed at $2.95 for the first 200 cubic feet of water, and $0.53 for each additional 100 cubic feet ($0.71 per 1,000 gallons). There is a maximum monthly fee of $54.05 for sewer service on any account. Sewer charges do not accrue against account 60-0490-00, which is primarily for cooling tower consumption.

Payment Office

Barbara Marion
U.S. Environmental Protection Agency
919 Kerr Research Drive
Ada, OK 74820

5.0 FACILITY INFORMATION

The Kerr Research Center contains a mixed use of conference, office, and laboratory space. The laboratory space is configured to conduct bench-scale analyses of environmental samples. Water is used for landscape irrigation, mechanical systems, sanitary needs, and laboratory processes. Additional details on facility water use are provided in the following sections.

Major Water Using Processes

Estimates of potable water consumption by major use area are provided in Table 2. These data reflect average facility water use between July 2003 and June 2005.

Table 2
Major Water Using Processes

Major Process	Annual Consumption (gallons)	Percent of Total	Comments
Irrigation water	2,178,000	52.2	Metered
Cooling tower make-up water	596,000	14.3	Metered
Sanitary water	800,000	19.2	Engineering estimate
Non-contact cooling water for air compressor cooling	up to 200,000	up to 4.8	Instantaneous measurement. Duration is unknown.
Miscellaneous laboratory water use	400,000 to 600,000	9.6 to 14.4	Calculated by difference
TOTAL	**4,174,000**	**100**	**Metered Total**

Additional detail on assumptions and calculations supporting these water use estimates are provided in Appendix A.

Measurement Devices

Incoming city water is supplied through six meters as indicated on Table 1. The make up lines to the outside ground loop for the ground source heat pump, and the internal cooling water closed loop are also equipped with flow totalizing meters. There is generally no flow through these meters, as they monitor water supply to closed-loop systems. No additional meters are installed on process equipment.

Under this plan, metered usage will be tracked monthly by the Facilities Manager to monitor trends in water consumption.

Shut-off Valves

Shut off valves for each water supply are located as follows:

LCC: Room A-9
Main Laboratory: ground floor core corridor
Annex: east annex bay
Cooling Tower: tower wall
Irrigation Sprinkler: below grade meter box

Occupancy and Operating Schedules

Approximately 160 employees work at the Ada laboratory. The laboratory operates on a flex time schedule and is typically occupied between 6:00 a.m. and 6:00 p.m., Monday through Friday.

6.0 BEST MANAGEMENT PRACTICE SUMMARY AND STATUS

FEMP has identified Water Efficiency Improvement Best Management Practices (BMPs) in 10 possible areas. Implementation of BMPs in four or more areas are required under FEMP guidance. The Ada laboratory has adopted and will maintain BMPs in six of the 10 areas, as checked below:

- ✓ Public Information and Education Programs
- ✓ Distribution System Audits, Leak Detection, and Repair
- ❑ Water-Efficient Landscape
- ✓ Toilets and Urinals
- ❑ Faucets and Showerheads
- ✓ Boiler/Steam Systems
- ✓ Single-Pass Cooling Systems
- ✓ Cooling Tower Systems
- ❑ Miscellaneous High Water-Using Processes
- ❑ Water Reuse and Recycling

Additional information related to each BMP area is provided in the following sections.

Public Information and Education Programs (BMP #1)

The Ada Laboratory promotes water conservation and awareness using the EPA laboratory "Every Drop Counts" water conservation poster series. Conservation posters are displayed in prominent locations within the laboratory. In addition, employees have been educated on water and other resource conservation topics through the implementation of the laboratory EMS.

Distribution System Audits, Leak Detection, and Repair (BMP #2)

Facility staff are trained to report leaks and malfunctioning water-using equipment to the Facilities Manager. Reported maintenance problems are assigned a work order, which is completed promptly by the facility operations and maintenance (O&M) contractor. Work orders are tracked through completion and closeout. In addition, O&M contractor staff perform a twice daily visual inspection of the building mechanical room and corridors. Any mechanical problems or leaks identified are addressed immediately.

A screening level system review was conducted in July 2005 and known water uses account for greater than 90 percent of water consumption.

Water-Efficient Landscape

Two of the facility's 16 acres are covered with irrigated landscape. The irrigated landscape is primarily covered with Bermuda grass. Irrigation water is applied four times per week between midnight and 6:00 am. The irrigated area is divided into 26 zones; each zone is watered for approximately 15 minutes during each irrigation cycle. The irrigation frequency and duration has been established to provide a lush, green appearance to the landscape.

BMP credit is not claimed in this area at this time. For BMP credit, the irrigation controller should be equipped with rain or soil moisture sensors that automatically prevent irrigation during periods of rainfall or when there is sufficient moisture in the ground for healthy turf growth. Irrigation water use will be carefully monitored so that the minimum quantity necessary for healthy turf growth is applied.

Toilets and Urinals (BMP #3)

Construction of the main laboratory occurred in 1965, prior to the implementation of current water-efficient sanitary fixture standards. The toilets and urinals in the main laboratory have not been replaced. Given the period of building construction, toilets are estimated to operate at 4.5 gallons per flush (gpf) and urinals at 3.0 gpf, rather than the current low-flow design standards of 1.6 and 1.0 gpf, respectively. GWERD has evaluated the cost of upgrading the sanitary fixtures in the main laboratory building to current water efficiency standards. Considering the number of fixtures that would need to be replaced, the working population of the laboratory, and the cost of water and sewer, we concluded that the payback period for the upgrade would be over 15 years for toilets and over 30 years for urinals. These long paybacks are not cost effective.

Toilets and Urinals in the LCC, constructed in 1993, do meet current water efficiency standards. The restroom in the Annex was upgraded in 1998 and also meets water efficiency standards. A full inventory of sanitary fixtures is provided in Table 3.

Table 3
Sanitary Fixture Inventory

Fixture	Location	Flow Rate	Quantity
Toilets	Main Laboratory	4.5 gpf	16
	LCC, Annex	1.6 gpf	12
Urinals	Main Laboratory	3 gpf	12
	LCC, Annex	1.0 gpf	4
Lavatory Sinks	Main Laboratory	3 gpm	16
	LCC, Annex	2 gpm	12
Showers	All	2.5 gpm	8

Janitorial staff and employees are trained to report leaks or other maintenance problems to the Facilities Manager or O&M supervisor, which are immediately corrected.

BMP credit is claimed in this area, as best O&M practices are utilized, and sanitary fixtures have been upgraded to water-efficient designs when it has been cost effective to do so.

Faucets and Showerheads

Table 3 provides an inventory of lavatory faucets and showerheads. All showerheads meet the current water efficiency standard of 2.5 gpm or less. Lavatory faucets in the LCC and Annex meet the water efficiency design standard of 2.2 gpm or less. Faucets in the main laboratory are rated at 3.0 gpm. Building water pressure is maintained at approximately 70 pounds per square inch, within the range needed for optimum system performance.

Janitorial staff and employees are trained to report leaks or other maintenance problems to the building engineer, which are immediately corrected.

BMP credit is not claimed at this time, pending installation of flow restrictors to limit lavatory faucet flow in the main laboratory rest rooms to 2.2 gpm or less (1.0 gpm is recommended).

Boiler/Steam Systems (BMP #4)

In a project completed in 2004, two steam boilers were replaced with electric ground source heat pumps. The heat pumps operate using external and internal closed cooling water loops, which consume virtually no water. BMP credit is claimed in this area since the boilers, and associated condensate blow-down, have been eliminated.

Single-Pass Cooling (BMP #5)

The laboratory implemented an initiative in the early 1990s to eliminate the use of single-pass cooling water. All laboratory equipment cooling needs are now supplied by point of use, air-cooled chiller units, no single pass cooling water is utilized. The only remaining use of single pass water is for cooling of the air compressor in the mechanical room. The flow of cooling water (approximately 0.4 gpm) is controlled with a solenoid valve so the water only flows while the compressor is running.

Cooling Tower Systems (BMP #6)

The laboratory is equipped with a two cell cooling tower, rated at 450 tons of total cooling capacity. Since the ground source heat pump system came on line, the laboratory has only been required to operate one of the tower cells. A cooling tower maintenance contractor performs a monthly quality, performance, and water chemistry review of cooling tower operation. Chemical treatment is provided to control scale and corrosion. A conductivity meter set at 1,800 *u*S/cm is used to control blowdown. This set point results in efficient water use, as the facility achieves 4 cycles of concentration in the cooling tower. Cooling tower make-up water quantities are metered separately and recorded monthly. The facility does not pay for sewer service on the meter that supplies the cooling tower.

Miscellaneous High Water-Using Processes

Current laboratory processes do not use significant quantities of water; no specific BMP credit is claimed in this area. The laboratory does operate one Steromaster autoclave; the autoclave is configured so that tempering water is only discharged when steam condensate is draining from the autoclave.

Water Reuse and Recycling

No BMP credit is claimed in this area.

7.0 DROUGHT CONTINGENCY PLAN

Information on drought and water resource monitoring in Oklahoma can be reviewed at:

http://www.owrb.state.ok.us/supply/drought/drought_index.php

The Oklahoma Department of Environmental Quality maintains information on local water systems experiencing problems or implementing water use restrictions at:

http://www.owrb.state.ok.us/supply/drought/dr7_systems.php

In the event of a drought or other water supply shortage, GWERD will follow the water use recommendations and restrictions of the City of Ada. As required, the Facilities Manager, in consultation with the Laboratory Director, will implement the facility response to City of Ada water use restrictions.

8.0 COMPREHENSIVE PLANNING

The Facilities Manager will ensure that water supply, wastewater generation, and water efficiency BMPs are taken into account during the initial stages of planning and design for any facility renovations or new construction. These factors will also be considered prior to the purchase and installation of any equipment that would measurably change facility water consumption.

9.0 OPPORTUNITIES FOR FURTHER WATER CONSERVATION

GWERD is considering the following projects to achieve additional reductions in water use:

1) **Upgrade Irrigation System Control.** Irrigation water use will be carefully monitored so that the minimum quantity necessary for healthy turf growth is applied. A rain or moisture sensor will be installed on the irrigation control system so the system will not operate when existing moisture levels are adequate. Such sensors typically reduce water use by 15 to 20 percent. The laboratory currently spends $4,700 per year for 2.2 million gallons of irrigation water. A rain or moisture sensor could save $700 to $900 per year. Also note that approximately $500 of the annual cost of irrigation water is for sewer use fees. GWERD could explore the possibility of getting the City of Ada to drop the sewer use fee from the irrigation water meter.

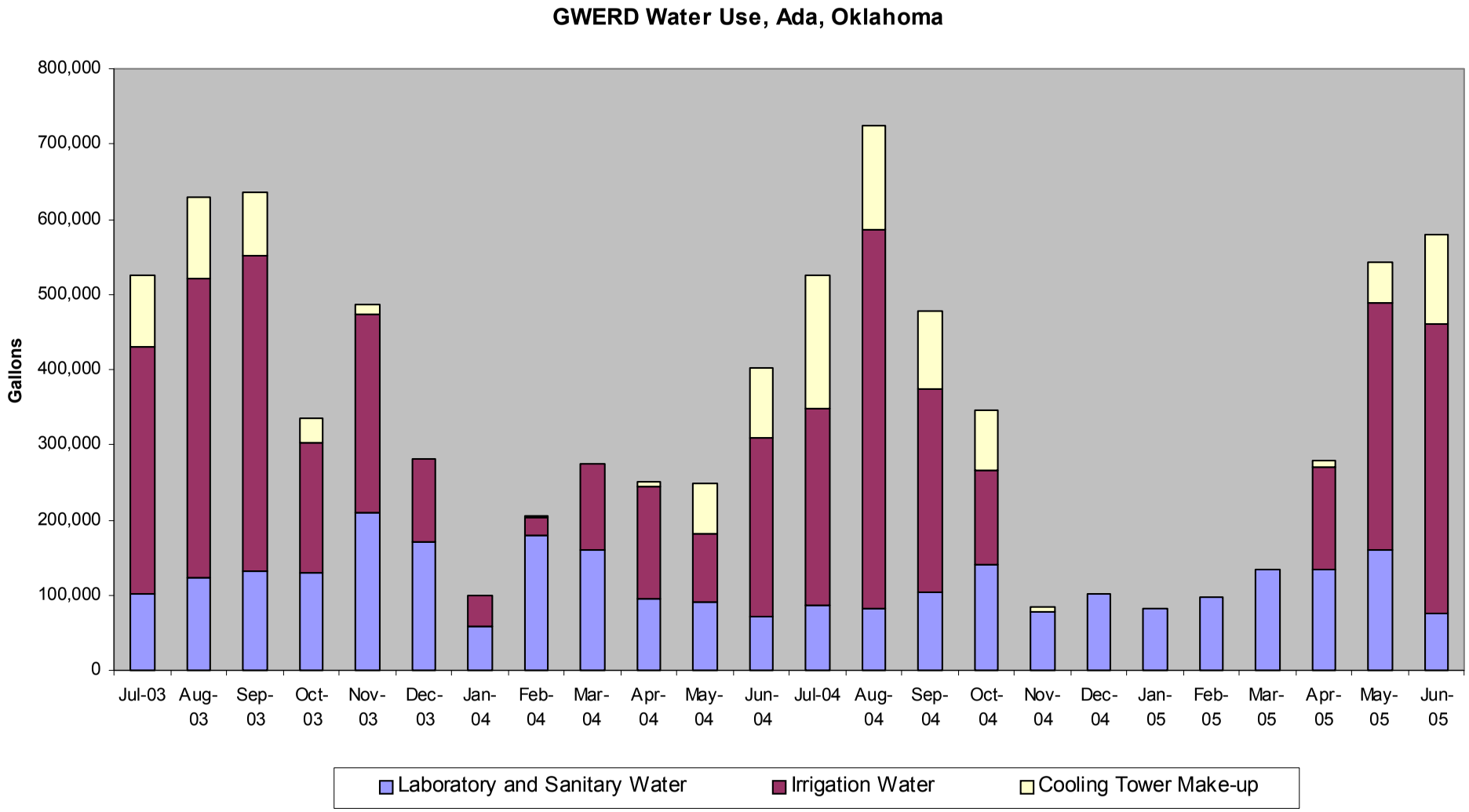
2) **Install Lavatory Faucet Flow Restrictors.** Faucet flow restrictors that limit flow to 1.0 gpm can be installed for a few dollars each. The faucet flow restrictors are estimated to save 65,000 gallons and $125 per year, and provide payback within 1 or 2 years.

APPENDIX A

WATER USE AND WATER BALANCE SUPPORTING CALCULATIONS

Ground Water and Ecosystems Restoration Division, Ada, Oklahoma

Major Process	Annual Consumption (gallons)	
Irrigation water	2,178,000	Based on monthly meter readings
Cooling tower make-up water	596,000	Based on monthly meter readings
Sanitary water	800,000	Engineering estimate calculated based on 160 people generating 20 gallons/day, 250 days per year. 160 * 20 * 250 = 800,000 gallons
Non-contact cooling water for air compressor cooling	up to 200,000	Based on instantaneous flow measurement of 1.5 liter per minute. Valve stuck in open position, duration of defect is unknown. 1.5 L/min * .264 gal/L * 60 min/hr * 24 hr/day *365 day/year = 208,138 gallons. This flow rate is included in the water balance calculation as a worst case estimate. The stuck valve was corrected in July 2005.
Miscellaneous laboratory water use	400,000	Calculated by difference: 4,174,000 - 2,178,000 - 596,000 - 800,000 - 200,000 = 400,000 gallons
TOTAL	**4,174,000**	**Average annual usage, July 2003 to June 2005**


GWERD Water Use, Ada, Oklahoma
Gallons
800,000
700,000
600,000
500,000
400,000
300,000
200,000
100,000
0
Jul-03
Aug-03
Sep-03
Oct-03
Nov-03
Dec-03
Jan-04
Feb-04
Mar-04
Apr-04
May-04
Jun-04
Jul-04
Aug-04
Sep-04
Oct-04
Nov-04
Dec-04
Jan-05
Feb-05
Mar-05
Apr-05
May-05
Jun-05
Laboratory and Sanitary Water
Irrigation Water
Cooling Tower Make-up

GWERD Water Use Data
(gallons)

	Laboratory and Sanitary Use	Irrigation	Cooling Tower	Total
Jul-03	102,483	327,145	96,498	526,126
Aug-03	123,428	396,968	108,467	628,863
Sep-03	132,405	418,908	85,278	636,591
Oct-03	128,665	173,548	33,662	335,874
Nov-03	210,202	264,062	11,221	485,484
Dec-03	171,303	110,711	0	282,015
Jan-04	57,600	40,896	0	98,496
Feb-04	178,784	24,933	748	204,465
Mar-04	160,831	113,704	748	275,282
Apr-04	95,750	147,613	8,229	251,592
May-04	91,262	89,766	67,325	248,353
Jun-04	71,813	238,381	92,010	402,204
Jul-04	87,522	261,316	177,288	526,126
Aug-04	82,286	503,685	139,137	725,107
Sep-04	104,727	268,303	103,979	477,009
Oct-04	140,633	124,677	80,041	345,352
Nov-04	78,545	0	5,236	83,782
Dec-04	102,483	0	0	102,483
Jan-05	81,537	0	748	82,286
Feb-05	96,498	0	0	96,498
Mar-05	133,901	0	0	133,901
Apr-05	133,153	137,641	8,977	279,771
May-05	159,335	330,137	52,364	541,835
Jun-05	75,553	383,997	119,688	579,238
Jul 03 - Jun 04	1,524,526	2,346,633	504,186	4,375,344
Jul 04 - Jun 05	1,276,173	2,009,756	687,458	3,973,387
TOTAL	2,800,699	4,356,389	1,191,644	8,348,732
Annual Average	**1,400,350**	**2,178,194**	**595,822**	**4,174,366**